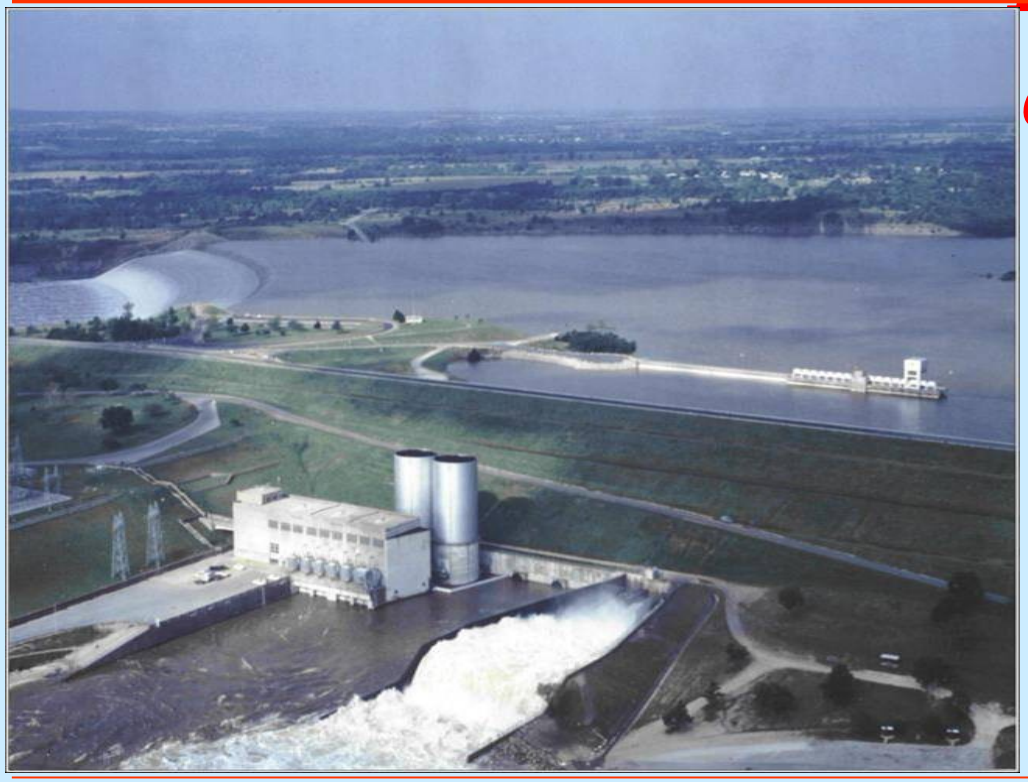
US Army Corps of Engineers®

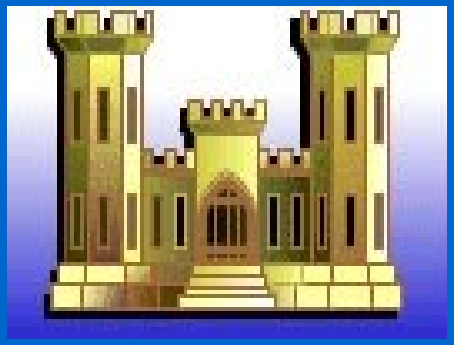
The Corps of Engineers ation Case Study

Lake Texoma Oklahoma and Texas



Presented by:
John Grothaus, Kansas City District
Courtesy of Jan Hotubbee Tulsa District

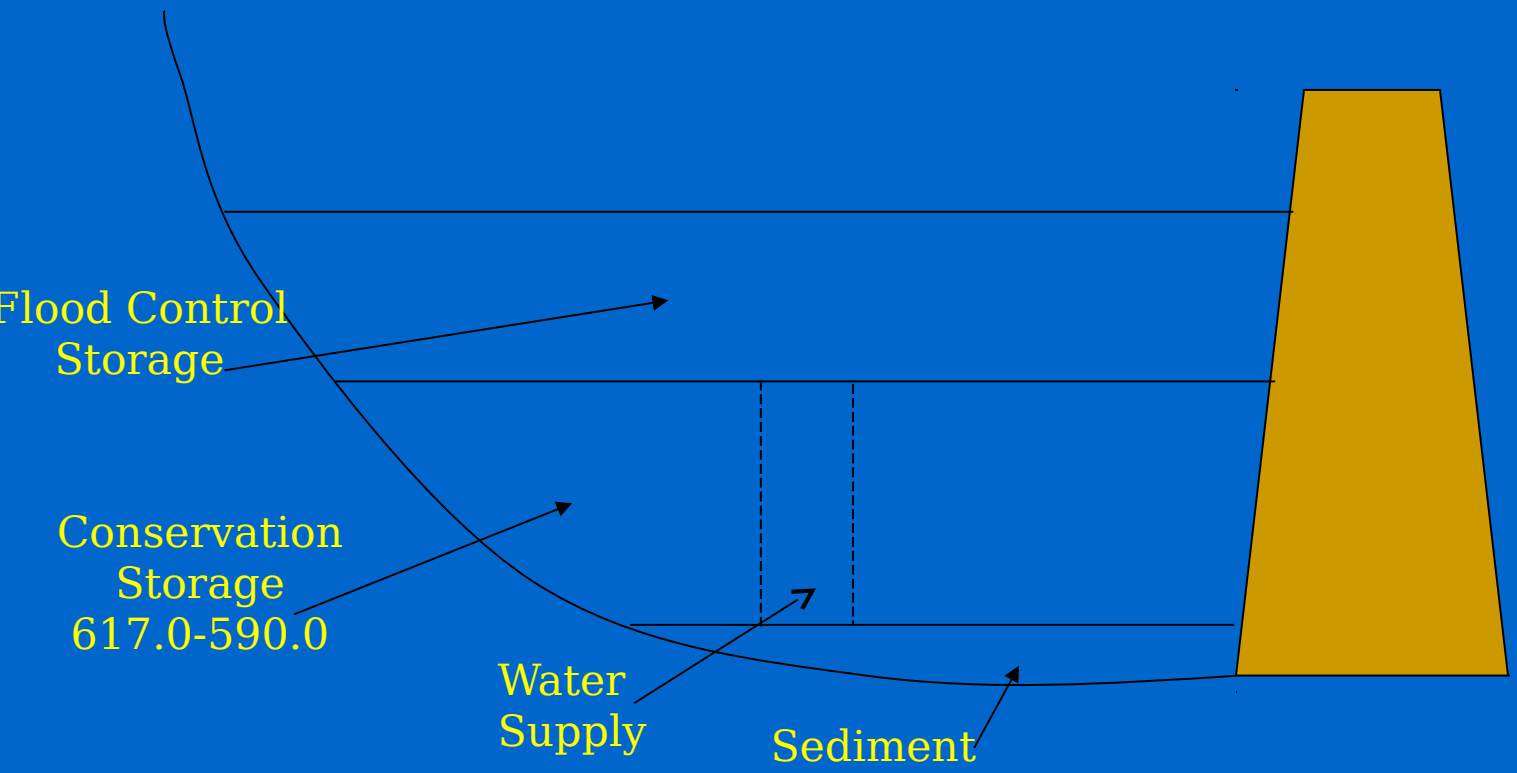
Planning Associates Program
Kansas City, Missouri
July 2006

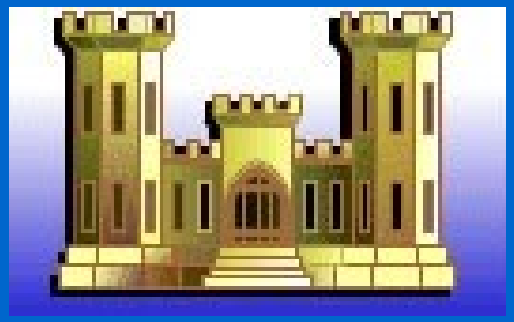


Reallocation Case Study

- Project Background
- Authority
- Previous Reallocations
- Alternatives
- Storage/yield relationship
- Pricing of storage
- Storage accounting
- Crediting the PMA

Water Supply in a Multipurpose Project



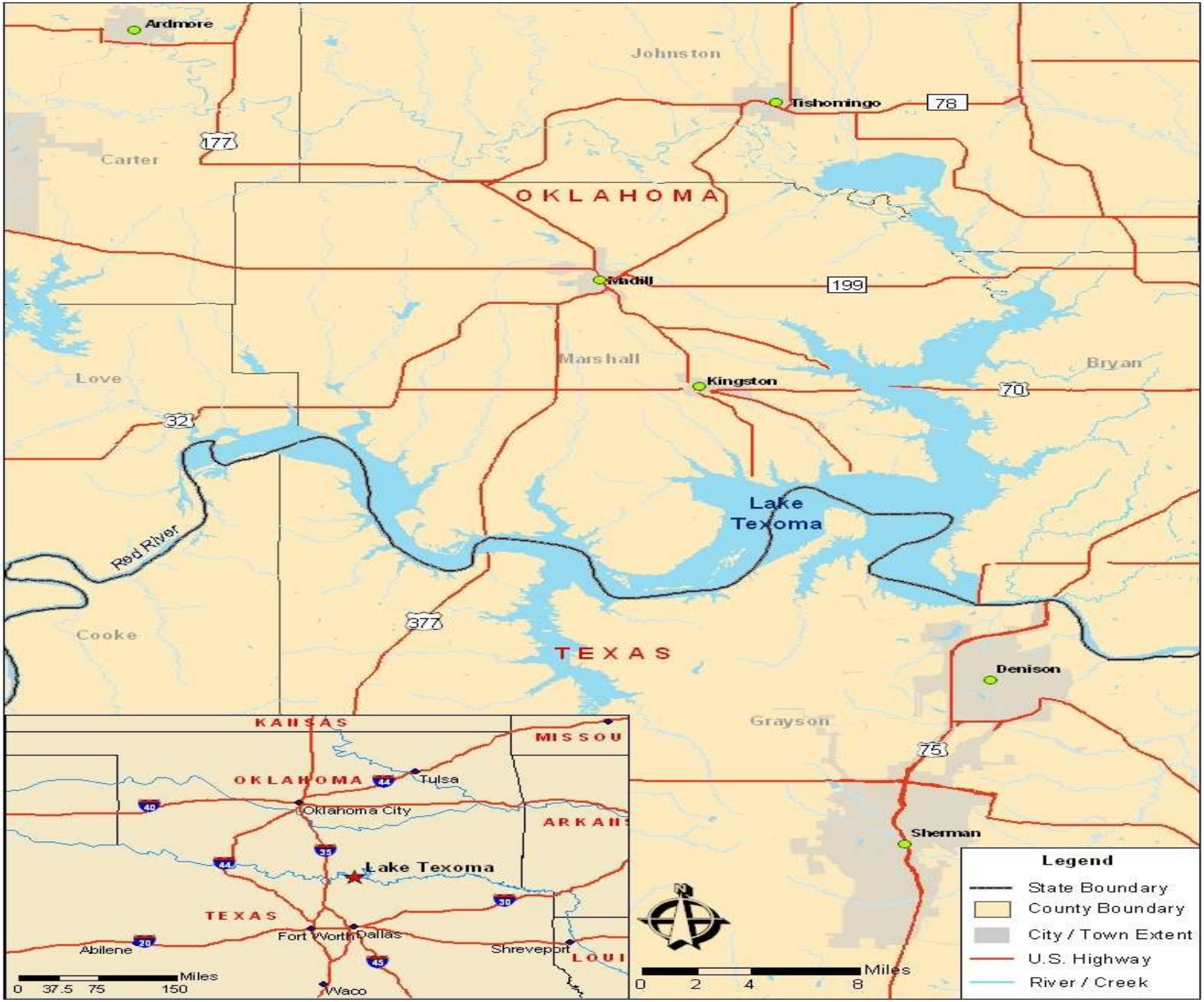


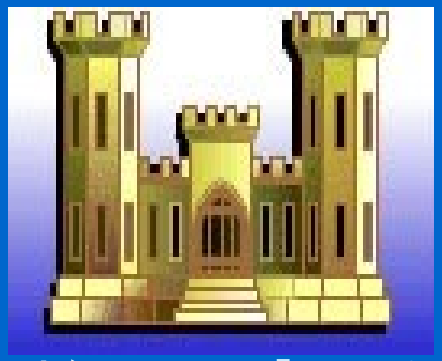
Water Supply Authority

- Public Law 85-500, WSA of 1958
- Assists states and local entities in developing water supplies in Federal projects
- Authorized Sec Army to modify projects to include water supply w/o further Congressional approval
- Water supply users pay for storage based on all purposes and share equitably in benefits of multi-purpose construction

Why Lake Texoma?

- Current reallocation
- Closed system on the power grid
- One of the largest reallocations that will have occurred in the Corps (if approved)


Ardmore
Johnston
Tishomingo
78
177
Carter
OKLAHOMA
Madill
199
Marshall
Bryan
Love
Kingston
70
32
Lake
Texoma
Red River
377
Cooke
TEXAS
Denison
Grayson
75
Sherman
KANSAS
MISSOU
OKLAHOMA
Tulsa
Oklahoma City
ARKAN
Lake Texoma
TEXAS
Fort Worth
Dallas
Abilene
Shreveport
LOUI
Waco
Miles
0 37.5 75 150
Miles
0 2 4 8
Legend
State Boundary
County Boundary
City / Town Extent
U.S. Highway
River / Creek



Lake Texoma Background

1) Authorized by the Flood Control Act of 1938
2) Original project purposes
   - flood control
   - hydropower
3) Water supply, recreation and fish and wildlife purposes added later
4) Water supply needs started developing at Lake Texoma in 1954

Lake Texoma Background

1) Public Law 273 approved 14 Aug 1953 added 21,300 acre-feet of water supply for City of Denison, TX

2) Public Law 146 approved 14 August 1957 added 22,600 acre-feet of water supply for City of Sherman, TX

Lake Texoma Background

1) Tulsa District raised the flood control pool to catch water in storage for water supply

2) Water was to be evacuated before flood event to maximum flood storage

Current Reallocation

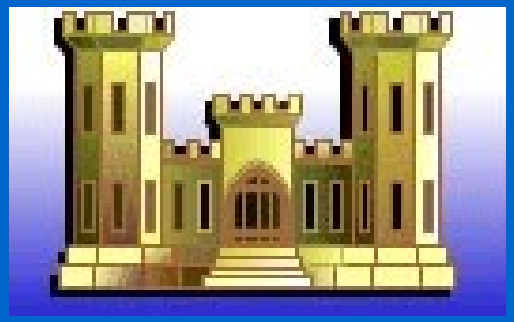
Authorized by Public Law 99-662 approved 17 November 1986 authorized the reallocation of an additional 300,000 acre-feet of hydropower storage for water supply – 150,000 acre-feet for TX and 150,000 acre-feet for OK

Previous Reallocations

- 1983 Reallocation – 72,600 acre-feet

  - 50k reallocated for storages under contract and left 8,900 for future users, and 22,600 reserved by PL
- 1985 Reallocation – 77,400 acre-feet

  - Determined additional storage would not adversely impact other purposes
- 1992, 1997 and 2004 Reallocations – Supplemental to 1983 and 1985

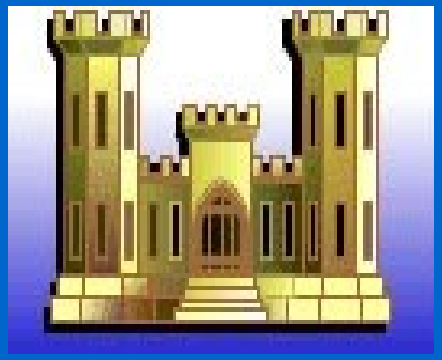


Texoma Case Study Reallocation Steps to Take

1. Develop alternatives
2. NEPA documentation
3. Get new sediment survey done (if needed)
4. Develop new area-elevation-capacity tables (Texoma conservation pool 590.0’ -617.0’)
5. Determine storage/yield relationship
6. Work with HAC and PMA to develop benefits and revenues foregone
7. Update the cost of storage

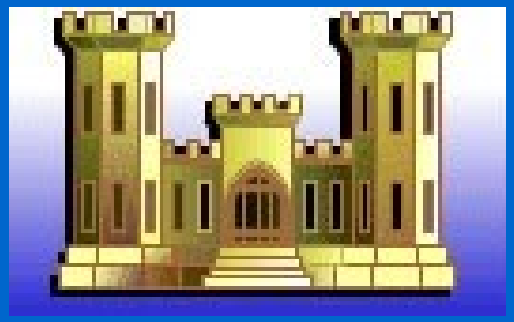
Alternatives Considered

- No Action
- Reallocating Flood Control Storage
- Building low-water dam below the main dam
- Reallocating Hydropower Storage



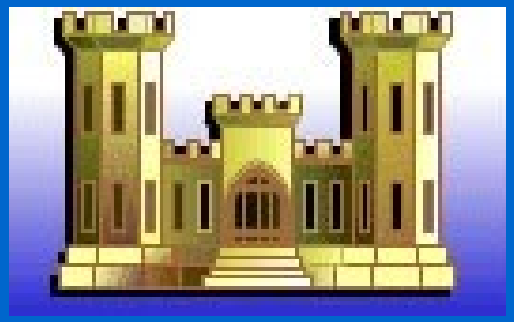
- Volumetric Survey (Sediment survey)
  - 1942 survey- based on quads (880,000 ac-ft)
  - 1969 survey – not much better
  - 1985 survey – cross sections off of monuments (1,114,909 ac-ft)
  - 2002 survey – bathymetric (986,740 ac-ft)

- NEPA documentation
- Coordination with HAC and SWPA
- Power Benefits Foregone Report



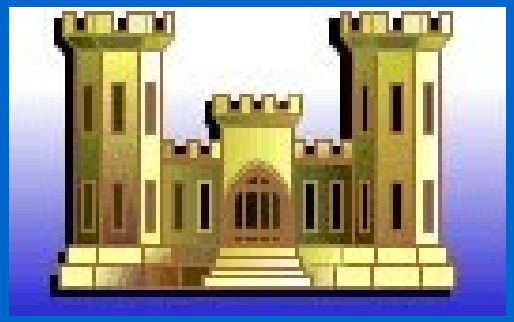
Storage/Yield Relationship

- SUPER - daily simulation model (Suite of computer programs)
- Determine true yield of conservation storage at end of project life (2044)
- Yield needed to determine critical dependable water supply demand if entire reallocated storage is used for water supply
- This gives us worse case demand for water supply during critical drought (dependability)



Texoma Case Study

HAC HYDROPOWER ANALYSIS



Water Supply Withdrawal Alternatives

- **Base Case Alternative**. Current operations with full use of existing water supply allocation of 150,000 AF.
- **300,000 AF Alternative**. Base case alternative with an additional 150,000 AF reallocated from hydropower (conservation) storage for water supply.
- **450,000 AF Alternative**. Base case alternative with an additional 300,000 AF reallocated from hydropower (conservation) storage for water supply.

Price of Reallocation

Highest of:

1. Benefits Foregone

--based on the cost of the most likely alternative thermal source of power.

--divided into two components:

lost energy

lost capacity

Annual Hydropower Benefits Foregone
Due to Reallocation from Conservation Pool Storage in Lake Texoma

Allocation Alternatives	**300,000 AF**	**450,000 AF**
Annual Energy Losses (MWh)	11,995	23,792
Energy value ($/MWh)	$33.23	$33.23
Annual energy benefit foregone	**$398,600**	**$790,600**
Capacity Losses (kW)	2,310	5,472
Capacity value ($/kW)	$111.80	$111.80
Annual capacity benefit foregone	**$258,300**	**$611,800**
Total Annual Benefits Foregone	**$656,900**	**$1,402,400**

Price of Reallocation

2. Revenues Foregone

-- revenues to Treasury lost due to reduced power production (based on the power marketing agency's (PMA) current contract rates)

Price of Reallocation

2. Revenues Foregone

-- For Lake Texoma the rates are:

- Energy charge: 8.25 mills/kWh
- Capacity charge: $23.52/kW-year

Hydropower Revenues Foregone
Due to Reallocation from the Conservation Pool Storage in Lake Texoma

Allocation Alternatives	**300,000 AF**	**450,000 AF**
Annual Energy Losses (MWh)	11,995	23,792
Energy charge ($/MWh)	$8.25	$8.25
Annual energy revenues foregone	**$99,000**	**$196,300**
Capacity Losses (kW)	12,730	28,263
Capacity charge ($/kW)	$23.52	$23.52
Annual capacity revenues foregone	**$299,400**	**$664,700**
Total Annual Revenues Foregone	**$398,400**	**$861,000**

Price of Reallocation (cont.)

3. Replacement Costs

   --an NED cost similar to power benefits foregone for hydropower and is a redundant figure

   --market-based replacement - the PMA can receive credit to offset additional costs if less hydropower is available

Price of Reallocation (cont.)

4. Updated Cost of Storage =

$$\frac{(TC - SP)}{\text{Total usable storage space (ac-ft)}} \times \text{Storage reallocated (ac-ft)}$$

TC = total costs of construction updated using Civil Works Construction Cost Index System (CWCCIS) and ENR

SP = specific costs = costs of identifiable project features for a specific purpose updated using CWCCIS and ENR

Price of Reallocation (cont.)

4. Updated Cost of Storage =

Project Joint-use Construction Cost

$45,810,877 x (300,000/3,598,169) =

$45,810,877 x .08337 = $3,819,253

Mid-point of construction period – September 1941

ENR INDEX – Sep 1941 - 263

ENR INDEX – Oct 2004 – 7314

7314/263 = 27.8

Updated Cost - $3,819,253 x 27.8 = $106,175,233

Price of Reallocation (cont.)

Interest & Amortization

.0627645 x $106,175,233 = $6,664,045 for 30 years at 5.125% interest

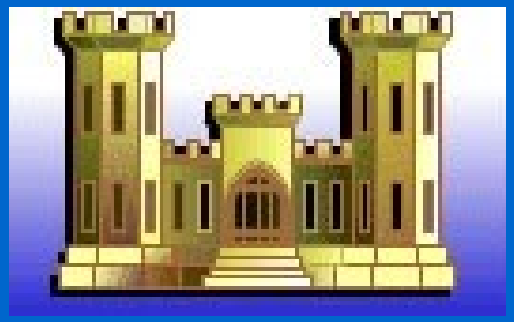
Annual return to Treasury

Updated cost of storage - $6,664,045

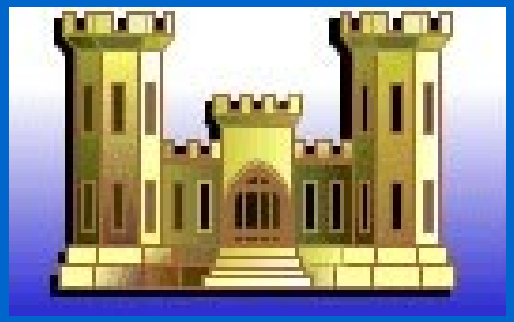
Revenues Foregone - $ 398,400

Benefits Foregone - $ 656,900

Replacement Costs - $ Same as Benefits (or documented amount)

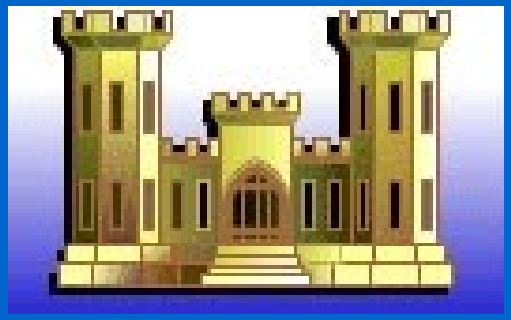


Storage Accounting

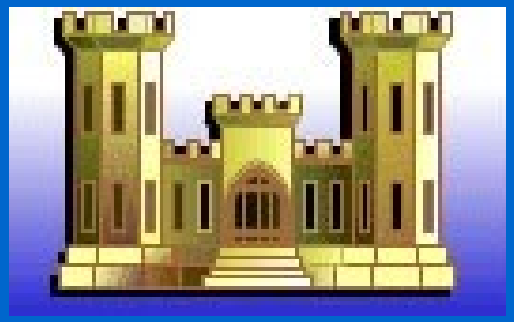


Storage Accounting

- Why do we care?
- How do we do it?
- What do we do with the information?

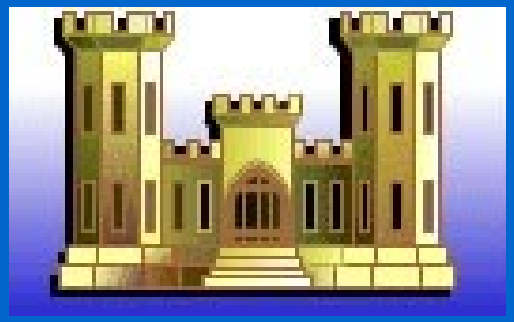


CREDIT TO POWER MARKETING AGENCIES



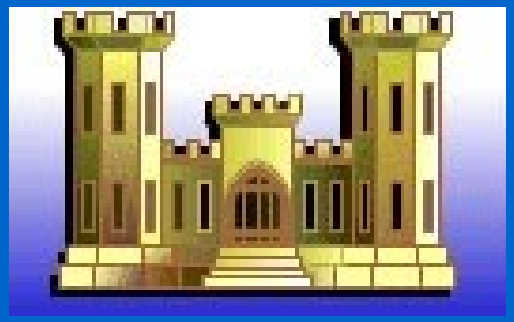
PMA Authority

- Section 5, Public Law 534
- Excess power delivered to DOE
- DOE markets power at lowest rate to consumer
- Rates include recovery to produce and transmit
- Amortize capital investment over a period of years



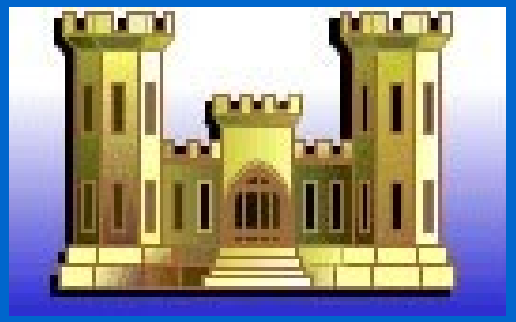
1944 vs 1958 Acts

- 1944 – hydropower is project purpose produced at Federal expense in return for power sales to repay that expense
- 1958 Act – authorizes Sec Army to supercede hydropower production in return for non-Federal payment



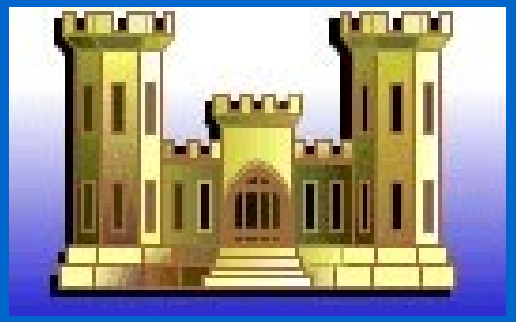
General Counsel Legal Opinion

- "…..opinion that the Secretary of the Army is authorized to provide such credits to Corps accounts to the extent that the credits reasonably reflect the economic consequences of the reallocation to the Federal government."



General Counsel Legal Opinion (continued)

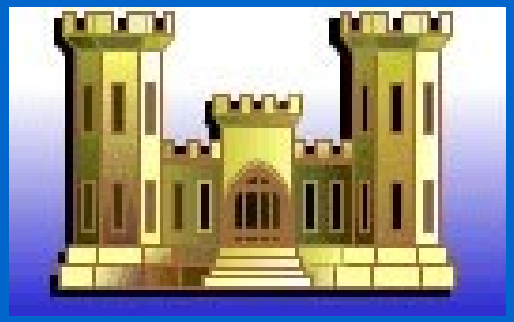
- "The COE current practice of crediting the new water supply revenues as hydropower income up to the amounts of hydropower revenues foregone is one of perhaps many acceptable accounting methods."



More General Counsel Legal Opinion

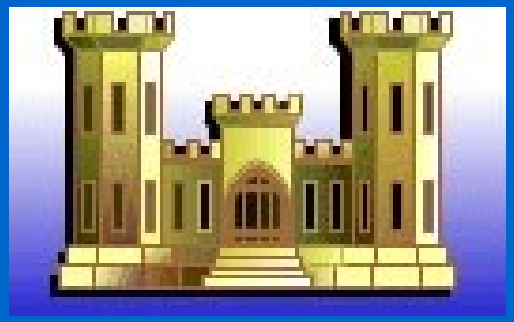
- This opinion is restricted to a COE project accounting response to the changed circumstance of hydropower and water supply that may occur due to reallocation. COE is not legally obliged or authorized to provide any funds to another government agency or non-Federal interest affected due to the reallocation.

Legal obligation: HP users “own” no storage. Under Section 5 of 1944 FCA, Corps authorized to turn over to DOE excess power. DOE, thru Federal Power Marketing Agencies sell the power to various local power customers pursuant to negotiated marketing agreements.



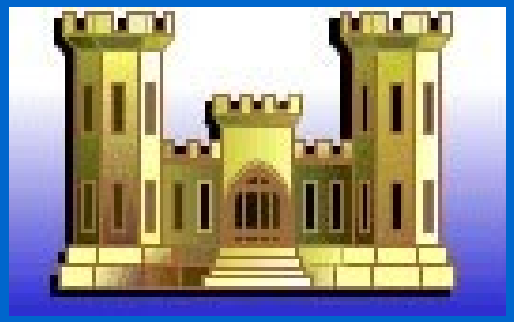
Crediting to PMA

- Repayment for hydropower revenues lost are based on:
- Benefits foregone
- Revenues foregone
- Replacement costs
- Updated cost of storage



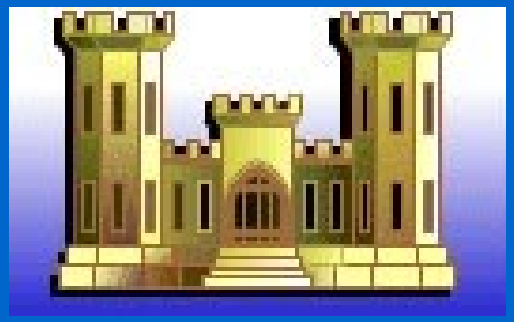
Crediting to PMA

- Reallocated water supply contracts have a 30-year repayment
- When annual water supply payments are collected, a portion of the payment (based on hydropower analysis provided by HAC) is credited to power
- The credits are reported to the PMA as a line item on the COE's power reports



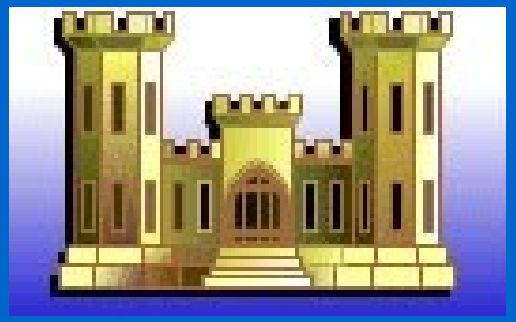
Crediting to PMA

- Work category purpose code linked to power has been created in CEFMS to collect hydropower revenues
- Credit must be broken down (P/I payments)
- When water supply payments end the only funds that might be used to credit PMA would be from joint use O & M payment



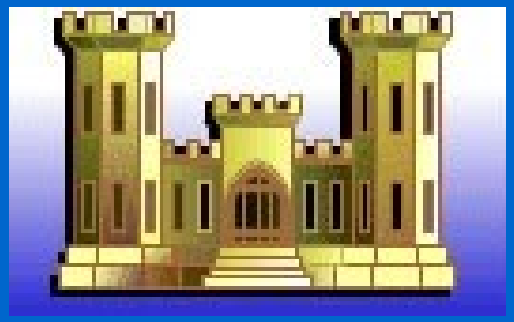
Crediting to PMA

- If water supply payment is made in lump sum:
  - Take repayment for hydropower credit and present value it using current interest rate
  - Make a one-time credit to PMA
  - Still must be broken down into P/I in CEFMS



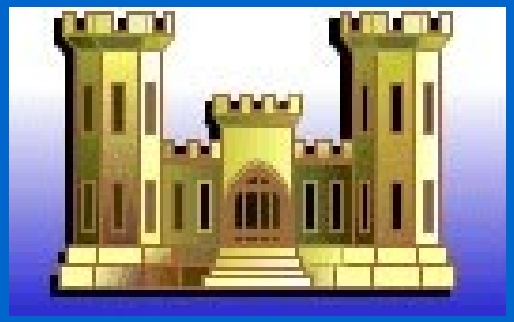
Other Factors that Affect Credit to PMA

- Hydropower units have been paid off – what capital investment is left to credit?
- Preference customer contracts are in place that could affect the amount of credit
- Special Letter of Agreement between Chief of Engineers and PMA



Conclusion

- Hydropower crediting appears to be a “gray” area to most districts (including Tulsa)
- Policy on hydropower crediting is broad and should be better defined
- RMO/F&A personnel should take a more active role in developing SOP on how to credit power accounts



DISCUSSIONS & QUESTIONS?